CLAIMS

Please amend claims 1-18 as follows:

1. (Currently Amended) A method for the decoding of a received signal comprising symbols distributed in at least one of space, time, ~~and/~~or frequency by a space-time or space-frequency encoding matrix,

wherein the method implements the following steps:

a space-time decoding, which is the inverse of a space-time encoding implemented at emission, delivering a decoded signal;

an equalization of said decoded signal, delivering an equalized signal;

a first estimation of the symbols forming the received signal, delivering an estimated signal;

and at least one iteration of an interference cancellation step, each iteration comprising the following sub-steps:

subtraction, from said equalized signal, of said estimated signal multiplied by an interference matrix, delivering an optimized signal ;

diversity pre-decoding of said optimized signal, which is the inverse of a diversity pre-encoding implemented at emission~~carried out when said signal is emitted~~, delivering pre-decoded data;

estimation of the symbols forming said optimized signal, from said pre-decoded data, delivering new estimated symbols; and

diversity pre-encoding, identical to said diversity pre-encoding implemented at emission, applied to said new estimated symbols, to give a new~~n~~ estimated signal, except for the last iteration~~.~~,

and wherein said first estimation comprises the following steps:

diagonalization, by multiplication of the equalized signal by a diagonalization matrix, leading to a diagonal total encoding/channel/decoding matrix taking account of at least said encoding matrix~~,~~ and of a decoding matrix that is the conjugate transpose of said encoding matrix;

diversity pre-decoding, which is the inverse of the diversity pre-encoding implemented at emission of said signal, fed by the diagonalization step and delivering the pre-decoded data;

estimation of the symbols forming said received signal, from said pre-decoded data, delivering the estimated symbols;

diversity pre-encoding, identical to said diversity pre-encoding implemented at emission, applied to said estimated symbols, to give the estimated signal.

2. (Cancelled)

3. (Currently Amended) The method according to claim ~~2~~1, wherein:

– said space-time decoding and equalization steps, ~~and~~/or

– said equalization and diagonalization~~conversion~~ steps, or

– said space-time decoding, equalization and diagonalization steps,

are done jointly.

4. (Currently Amended) The method according to claim 1, wherein said ~~encoded~~ distributed symbols are emitted by means of at least two antennas, which produce different corresponding transmission channels and wherein the method of decoding takes the different corresponding transmission channels comprehensively into account.

5. (Currently Amended) The method according to claim ~~2~~1, wherein said equalization step implements an equalization according to one of the techniques belonging to the group comprising:

- ~~MMSE~~ Minimum Mean Squared Error type equalization;
- ~~EGC~~ Equal Gain Combining type equalization;
- ~~ZF~~ Zero Forcing type equalization; and
- equalization taking account of a piece of information representing a signal-to-noise ratio between the received signal and a reception noise.

6. (Currently Amended) The method according to claim ~~2~~1, wherein said steps of symbol estimation implement a soft decision, associating a piece of confidence information with the soft decision and said subtraction step or steps take account of said pieces of confidence information.

7. (Currently Amended) The method according to claim ~~2~~1, wherein said received signal comprises a multicarrier signal.

8. (Previously presented) The method according to claim 1, wherein said pre-encoding is obtained by one of the following methods:

a spread-spectrum technique; and

linear pre-encoding.

9. (Currently Amended) The method according to claim 1, wherein the method implements an automatic gain control step at least:

- before or after said equalization step, ~~and/~~or
- during at least one of said iterations.

10. (Previously presented) The method according to claim 1 and further comprising a channel-decoding step, symmetrical with a channel-encoding step implemented at emission.

11. (Previously presented) The method according to claim 10, wherein said channel-decoding step implements a turbo-decoding operation.

12. (Previously presented) The method according to claim 1 and further comprising at least one de-interlacing step and at least one re-interlacing step, corresponding to an interlacing implemented at emission.

13. (Previously presented) The method according to claim 1 and further comprising a step of improvement of a channel estimation, taking account of the estimated symbols during at least one of said iterations.

14. (Currently Amended) The method according to claim ~~2~~ 1 and further comprising transmitting by four antennas the signal to be received, referred to as the received signal, through at least one transmission channel, wherein said total encoding/channel/decoding matrix is equal

to:

$$G=\gamma\begin{bmatrix} A & 0 & 0 & J \\ 0 & A & -J & 0 \\ 0 & -J & A & 0 \\ J & 0 & 0 & A \end{bmatrix}$$

with :

$A=|h_1|^2+|h_2|^2+|h_3|^2+|h_4|^2$

$J=2\mathrm{Re}\{h_1h_4^*-h_2h_3^*\}$, representing the interference, and

$$\gamma=\frac{1}{|h_1|^2+|h_2|^2+|h_3|^2+|h_4|^2+\frac{1}{SNR}}$$

where: $H=\begin{bmatrix} h_1 & h_2 & h_3 & h_4 \\ -h_2^* & h_1^* & -h_4^* & h_3^* \\ -h_3^* & -h_4^* & h_1^* & h_2^* \\ h_4 & -h_3 & -h_2 & h_1 \end{bmatrix}$ is a matrix grouping the space-time encoding and the transmission channel,

and SNR represents the signal-to-noise ratio.

15. (Currently Amended) The method according to claim ~~2~~ 1 and further comprising transmitting by eight antennas the signal to be received, referred to as the received signal, through at least one transmission channel, wherein said total encoding/channel/decoding matrix is equal to:

$$G=\gamma\cdot H^H\cdot H=\gamma\begin{bmatrix} A & 0 & 0 & 0 & J & 0 & 0 & 0 \\ 0 & A & 0 & 0 & 0 & J & 0 & 0 \\ 0 & 0 & A & 0 & 0 & 0 & J & 0 \\ 0 & 0 & 0 & A & 0 & 0 & 0 & J \\ J & 0 & 0 & 0 & A & 0 & 0 & 0 \\ 0 & J & 0 & 0 & 0 & A & 0 & 0 \\ 0 & 0 & J & 0 & 0 & 0 & A & 0 \\ 0 & 0 & 0 & J & 0 & 0 & 0 & A \end{bmatrix}$$

~~with~~ $\cancel{A=|h_1|^2+|h_2|^2+|h_3|^2+|h_4|^2+|h_5|^2+|h_6|^2+|h_7|^2+|h_8|^2}$ ~~and~~

$$\cancel{J=2\,\mathrm{Im}\{h_1h_5^*+h_2h_6^*+h_3h_7^*+h_4h_8^*\}}$$

~~and~~ $\gamma=\dfrac{1}{|h_1|^2+|h_2|^2+|h_3|^2+|h_4|^2+|h_5|^2+|h_6|^2+|h_7|^2+|h_8|^2+\dfrac{1}{SNR}}$ with

$$A=2\cdot\left(|h_1|^2+|h_2|^2+|h_3|^2+|h_4|^2+|h_5|^2+|h_6|^2+|h_7|^2+|h_8|^2\right)$$ and

$$J=2\,\mathrm{Re}\left\{h_1h_5^*+h_2h_6^*+h_3h_7^*+h_4h_8^*\right\}$$

and $\gamma=\dfrac{1}{2}\cdot\dfrac{1}{|h_1|^2+|h_2|^2+|h_3|^2+|h_4|^2+|h_5|^2+|h_6|^2+|h_7|^2+|h_8|^2+\dfrac{1}{SNR}}$

where : $$H=\begin{bmatrix}
h_1 & h_2 & h_3 & h_4 & h_5 & h_6 & h_7 & h_8\\
h_2 & -h_1 & h_4 & -h_3 & h_6 & -h_5 & h_8 & -h_7\\
h_3 & -h_4 & -h_1 & h_2 & h_7 & -h_8 & -h_5 & h_6\\
h_4 & h_3 & -h_2 & -h_1 & h_8 & h_7 & -h_6 & -h_5\\
h_1^* & h_2^* & h_3^* & h_4^* & h_5^* & h_6^* & h_7^* & h_8^*\\
h_2^* & -h_1^* & h_4^* & -h_3^* & h_6^* & -h_5^* & h_8^* & -h_7^*\\
h_3^* & -h_4^* & -h_1^* & h_2^* & h_7^* & -h_8^* & -h_5^* & h_6^*\\
h_4^* & h_3^* & -h_2^* & -h_1^* & h_8^* & h_7^* & -h_6^* & -h_5^*\\
h_5 & h_6 & h_7 & h_8 & h_1 & h_2 & h_3 & h_4\\
h_6 & -h_5 & h_8 & -h_7 & h_2 & -h_1 & h_4 & -h_3\\
h_7 & -h_8 & -h_5 & h_6 & h_3 & -h_4 & -h_1 & h_2\\
h_8 & h_7 & -h_6 & -h_5 & h_4 & h_3 & -h_2 & -h_1\\
h_5^* & h_6^* & h_7^* & h_8^* & h_1^* & h_2^* & h_3^* & h_4^*\\
h_6^* & -h_5^* & h_8^* & -h_7^* & h_2^* & -h_1^* & h_4^* & -h_3^*\\
h_7^* & -h_8^* & -h_5^* & h_6^* & h_3^* & -h_4^* & -h_1^* & h_2^*\\
h_8^* & h_7^* & -h_6^* & -h_5^* & h_4^* & h_3^* & -h_2^* & -h_1^*
\end{bmatrix}$$

is a matrix grouping the space-time encoding and the transmission channel and SNR represents the signal-to-noise ratio.

16. (Currently Amended) The method of claim ~~14~~ 15 and further comprising, prior to the step of transmitting, encoding said signal to be received, wherein the encoding implements a

space-time encoding such that:

$$H=\begin{bmatrix}
h_1 & h_2 & h_3 & h_4 & h_5 & h_6 & h_7 & h_8 \\
h_2 & -h_1 & h_4 & -h_3 & h_6 & -h_5 & h_8 & -h_7 \\
h_3 & -h_4 & -h_1 & h_2 & h_7 & -h_8 & -h_5 & h_6 \\
h_4 & h_3 & -h_2 & -h_1 & h_8 & h_7 & -h_6 & -h_5 \\
h_1^* & h_2^* & h_3^* & h_4^* & h_5^* & h_6^* & h_7^* & h_8^* \\
h_2^* & -h_1^* & h_4^* & -h_3^* & h_6^* & -h_5^* & h_8^* & -h_7^* \\
h_3^* & -h_4^* & -h_1^* & h_2^* & h_7^* & -h_8^* & -h_5^* & h_6^* \\
h_4^* & h_3^* & -h_2^* & -h_1^* & h_8^* & h_7^* & -h_6^* & -h_5^* \\
h_5 & h_6 & h_7 & h_8 & h_1 & h_2 & h_3 & h_4 \\
h_6 & -h_5 & h_8 & -h_7 & h_2 & -h_1 & h_4 & -h_3 \\
h_7 & -h_8 & -h_5 & h_6 & h_3 & -h_4 & -h_1 & h_2 \\
h_8 & h_7 & -h_6 & -h_5 & h_4 & h_3 & -h_2 & -h_1 \\
h_5^* & h_6^* & h_7^* & h_8^* & h_1^* & h_2^* & h_3^* & h_4^* \\
h_6^* & -h_5^* & h_8^* & -h_7^* & h_2^* & -h_1^* & h_4^* & -h_3^* \\
h_7^* & -h_8^* & -h_5^* & h_6^* & h_3^* & -h_4^* & -h_1^* & h_2^* \\
h_8^* & h_7^* & -h_6^* & -h_5^* & h_4^* & h_3^* & -h_2^* & -h_1^*
\end{bmatrix}.$$

17. (Currently Amended) A receiver for receiving a received signal, comprising symbols distributed in at least one of space, ~~and~~ time, ~~and/~~or frequency by ~~means of~~ a space-time encoding matrix,

wherein the receiver comprises:

means of space-time decoding that is the inverse of ~~the~~ a space-time encoding implemented at emission, delivering a decoded signal;

means of equalization of said decoded signal, delivering an equalized signal;

first estimation means for the estimation of the symbols forming the received signal, delivering an estimated signal;

means for substracting, from said equalized signal, of said estimated signal multiplied by an interference matrix, delivering an optimized signal;

~~, and:~~

means of diversity pre-decoding of said optimized signal, performing a pre-decoding which is the inverse of a diversity pre-encoding ~~carried out at emission of said signal~~implemented at emission, delivering pre-decoded data;

~~means of~~second estimation means for the estimation of the symbols forming said optimized signal, from the pre-decoded data, delivering new estimated symbols; and

means of diversity pre-encoding, performing a pre-encoding identical to said diversity pre-encoding implemented at emission, applied to said new estimated symbols, to give a new estimated signal, except for the last iteration,

each symbol being processed by said means at least once;

~~said means of diversity pre-decoding, estimation, and diversity pre-encoding being implemented at least once for each symbol.~~

and wherein said first estimation means comprises:

means of diagonalization, by multiplying the equalized signal by a diagonalization matrix, leading to a diagonal total encoding/channel/decoding matrix taking account of at least said encoding matrix and of a decoding matrix that is the conjugate transpose of said encoding matrix;

means of diversity pre-decoding, performing a pre-decoding which is the inverse of the diversity pre-encoding implemented at emission of said signal, fed by the diagonalization step and delivering the pre-decoded data;

estimation means for the estimation of the symbols forming said received signal, from said pre-decoded data, delivering the estimated symbols;

means of diversity pre-encoding, performing a pre-encoding which is identical to said diversity pre-encoding implemented at emission, applied to said estimated symbols, to give the estimated signal.

18. (Currently Amended) A method for the decoding of a received signal comprising symbols distributed in at least one of space, time, ~~and/~~or frequency by means of a space-time or space-frequency encoding matrix, wherein the method comprises:

- diagonalization, obtained from a total encoding/channel/decoding matrix taking account of at least said encoding matrix, of a decoding matrix, corresponding to the matrix that is the conjugate transpose of said encoding matrix;
- demodulation, symmetrical with a modulation implemented at emission;

- de-interlacing symmetrical with an interlacing implemented at emission;
- channel decoding symmetrical with a channel encoding implemented at emission;
- re-interlacing, identical with the interlacing implemented at emission;
- re-modulation identical with the modulation implemented at emission, delivering an estimated signal; and
- at least one iteration of an interference cancellation step comprising a subtraction from an equalized signal of said estimated signal multiplied by an interference matrix, delivering an optimized signal.